

REMARKS

Please reconsider the application in view of the above amendments and the following remarks. Applicant thanks the Examiner for carefully considering this application.

Disposition of Claims

Claims 9, 11-13, and 15-20 are pending in this application. Claim 14 is currently withdrawn as a non-elected species, but will be rejoined if the elected species are in condition for allowance.

Claim Amendments

Claims 9, 15, 19, and 20 were amended by this reply to replace the term “obtainable” with the term “obtained.” Additionally, claim 9 was amended to correct a typographical error and to specify that the the claimed tetracarboxylic acid dianhydride is at least 30 mol % of the acid component. No new matter has been added by these amendments.

Rejection(s) under 35 U.S.C. § 112

Claims 9, 15, 19, and 20 were rejected under 35 U.S.C. § 112, ¶ 2 as being indefinite. Claims 9, 15, 19, and 20 have been amended by this reply to use the term “obtained” instead of “obtainable.” Thus, Applicant believes it is clear that the imide oligomer is obtained by the claimed means, and not by any other means. Accordingly, withdrawal of this rejection is respectfully requested.

Rejection(s) under 35 U.S.C. § 102

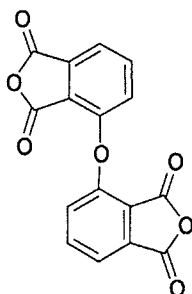
Claims 9, 11-13 and 15-20 are rejected under 35 U.S.C. § 102(b) as being anticipated by Chem Abstracts 136:7165, 136:7164, 136:7161, 136:7160, or 136:7159. These rejections are respectfully traversed.

As a preliminary matter, Applicant notes that the Chemical Abstract database search results cited by the Examiner do not constitute an enabling disclosure, as required under MPEP § 2121. In particular, when performing a Chemical Abstract search, the results only specifically list chemistry that matches the search terms, and do not describe how these chemical structures are related to one another. Thus, a comparison of a Chemical Abstract search result and the underlying support document (to which the Chemical Abstract is referring) reveals that the Chemical Abstract does not contain the level of disclosure necessary to make it an enabling disclosure. A prior art reference provides an enabling disclosure if the reference describes the claimed invention in sufficient detail to enable a person of ordinary skill in the art to carry out the claimed invention. *See Impax Labs. Inc. v. Aventis Pharm. Inc.*, 468 F.3d 1366, 1383 (Fed. Cir. 2006).

Thus, while Applicant submits that Chem Abstracts 136:7165, 136:7164, 136:7161, 136:7160, and 136:7159 are not enabling disclosures, in the effort of advancing prosecution, Applicant submits comments with respect to the underlying documents cited by these Chemical Abstract entries: JP 2001-323066 (cited by 136:7165), JP 2001-323062 (cited by 136:7164), JP 2001-323065 (cited by 136:7161), JP 2001-323064 (cited by 136:7160), and JP 2001-323063 (cited by 136:7159).

Claim 9 of the present disclosure requires, *inter alia*, thermoplastic imide oligomer obtained by polymerizing an acid component and a diamine component characterized

in that at least 30 mol % of the acid component is an aromatic tetracarboxylic acid dianhydride represented by formula (I);



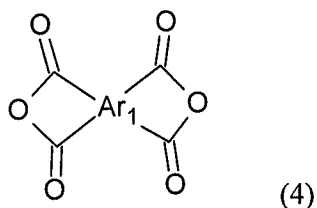
(I)

or its derivative, and with a the terminal of the imide oligomer molecule being capped by a dicarboxylic acid anhydride having a triple bond in the molecule. The claimed tetracarboxylic acid dianhydride represented by formula (I) may also be referred to as bis(2,3-dicarboxyphenyl)ether dianhydride or “3-ODPA.”

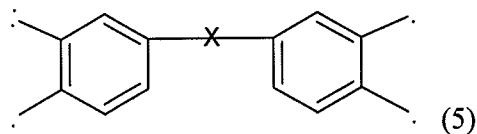
The underlying cited references, JP 2001-323066, JP 2001-323062, JP 2001-323065, JP 2001-323064, and JP 2001-323063 were all filed on the same date by the same inventors and applicant (Mitsui Chemicals Inc.), and all disclose inventions relating to “crosslinkable group-containing polyimide precursors for heat-resistant adhesives.” The references do not substantially differ from one another other than the specific diamine component being used in preparing the polyimide precursor. That is, each of these references contains a common description with respect to the acid component and the end-capping agent.

The Examiner asserts that these references disclose the thermoplastic imide oligomer obtained by polymerizing the claimed aromatic tetracarboxylic acid dianhydride with a diamine component and capped by a dicarboxylic acid anhydride having the claimed formula.

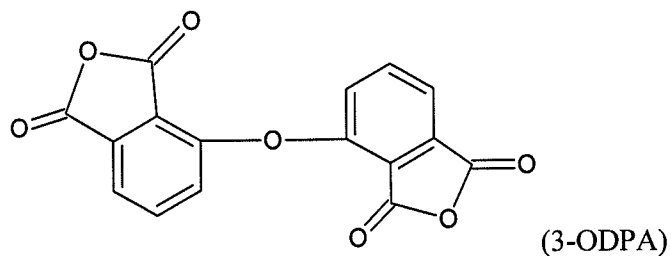
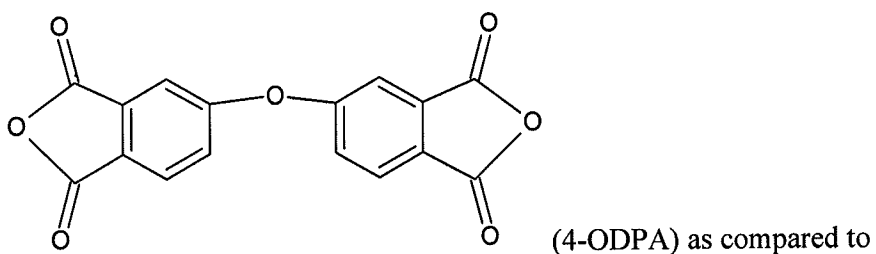
However, Applicant respectfully notes that the tetracarboxylic acid taught by the cited references (cited as general formula (4) in the cited references) as being the primary acid component does not encompass 3-ODPA. Specifically, general formula (4) of the cited references may include a tetracarboxylic dianhydride:



where Ar₁ may be a tetravalent group of formula (5), where X may be O



Thus, the tetracarboxylic acid taught by the cited references may be bis(3,4-dicarboxyphenyl)ether dianhydride or “4-ODPA” shown below (in comparison to 3-ODPA):



While the present application requires at least 30 mol % of the acid component to be 3-ODPA, the cited references all teach the use of 4-ODPA as the primary acid component. 3-ODPA is only taught by the cited references (*see* paragraphs [0034]-[0035] of the partial translation of JP 2001-323062 filed herewith) as an optional tetracarboxylic dianhydride that can be used “so long as [it does] not spoil the character and physical property of polyimide itself.” JP 2001-323062, paragraph [0035]. This statement is similarly made in each of the other JP patent documents as well.

The inventors of the present application have advantageously discovered that while when generally using a diamine containing an aromatic ring, the resulting imide oligomer products did not exhibit as much thermoplasticity and tended to be insoluble in solvents, when using a diamine containing an aromatic ring with an acid component that includes 3-ODPA, the resulting imide oligomer products exhibit both thermoplasticity and solubility in solvents. The increased level of solvent solubility for a polyimide is demonstrated in the enclosed Declaration of Hiroyasu Inagaki, one of the inventors of the present application, providing experimental results. Specifically, as shown in these experimental results, imide oligomers were comparatively produced using 3-ODPA vs. 4-ODPA, with the same diamine and end-capping agent. The solvent solubility of the resulting imide oligomers were compared for N-methyl-2-pyrrolidone (NMP), N,N-dimethylacetamide (DMAc), γ -butyrolactone (γ -BL), tetrahydrofuran (THF). In each instance, the imide oligomer formed using 3-ODPA possessed solvent solubility (in weight percent) ranging from a 2.38- to 82.5-fold improvement over that of the imide oligomer formed using the 4-OPDA. This vast difference in solubility likely results from the structural differences between 3-ODPA and 4-ODPA. Additionally, if this type of difference results in solvent solubility, it is also likely that other properties may vary between imides

formed with 3-ODPA and 4-ODPA. Thus, one skilled in the art, in viewing the teachings of the underlying references, would not be motivated to replace 4-ODPA with at least 30 mol % 3-ODPA to arrive at the claimed invention because one skilled in the art would appreciate that the structural differences between 3-ODPA and 4-ODPA would be likely to effect the physical properties of the resulting imide, and thus, the references teach away from the use of 3-ODPA. Furthermore, the experimental results provided in the Declaration enclosed herewith demonstrate that there is an unexpectedly good improvement in properties that result, further supporting non-obviousness.

Specifically, even if a *prima facie* case of obviousness has been met, *Graham v. John Deere Co.* (as well as *KSR v. Teleflex*) provides for the burden of proof to be shifted to the Applicant for rebuttal evidence and arguments. Rebuttal evidence may include secondary indicia of non-obviousness such as long-felt need within the industry for an adequate solution, failure of others to achieve the desired results, commercial success of a claimed invention, and professional approval of a claimed invention. These secondary considerations were recognized by the Supreme Court in *Graham v. John Deere Co.*, 148 USPQ 459, 474 (1966). In the words of the Court, “Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.” *Id.* at 467. The rationale for giving weight to the so-called “secondary considerations” is that they provide objective evidence of how the patented device is viewed in the marketplace, by those directly interested in the product. *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 7 USPQ2d 1222, 1230 (Fed. Cir. 1988). The patentability of the rejected claims is supported by abundant evidence that falls within the secondary considerations described above. “Objective indicia of nonobviousness, when present,

are invariably relevant to the determination under section 103 . . . Objective considerations may often be the most probative and cogent evidence of nonobviousness in the record.” *Litton Systems, Inc. v. Honeywell, Inc.*, 39 USPQ2d 1321, 1339 (Fed. Cir. 1996), remanded, 117 S. Ct. 1240 (1997) citing *Stratoflex, Inc. v. Aeroquip Corp.*, 218 USPQ 871, 879 (Fed. Cir. 1983). To be entitled to substantial weight, the applicant should establish a nexus between the rebuttal evidence and the claimed invention, *i.e.*, objective evidence of nonobviousness must be attributable to the claimed invention. MPEP § 2145.

Unexpected results also entitled to consideration in determining nonobviousness. Specifically, “a greater than expected result is an evidentiary factor pertinent to the legal conclusion of obviousness... of the claims at issued.” *In re Corkill* , 711 F.2d 1496 (Fed. Cir. 1985). Greater than expected is more than simply an additive effect or sum of each of the effects of various components taken separately. Rather, it must be greater than those which would have been expected from the prior art to an unobvious extent, and the results are of a significant, practical advantage. *Ex parte The Nutrasweet Co.*, 19 USPQ2d 1586 (Bd. Pat. App. & Int. 1991); MPEP § 2145.

The provided evidence shows that there is a vast and unexpected difference between imide oligomers formed with 3-ODPA and 4-ODPA. Thus, not only do the cited references not teach or suggest use of 3-ODPA in an amount ranging from at least 30 mol % of the acid component, but the cited references suggest that 3-ODPA might negatively effect the physical properties of the resulting imide, and the experimentation of the inventors of the present application has found an unexpectedly good improvement in solvent solubility, indicating a finding of non-obviousness.

Thus, in examining the teachings of JP 2001-323066, JP 2001-323062, JP 2001-323065, JP 2001-323064, and JP 2001-323063, it becomes apparent that one skilled in the art would not be motivated to modify their teachings to result in an imide oligomer obtained by polymerizing a diamine with an acid components having at least 30 mol % thereof of 3-ODPA, as required by claim 9 of the present application. Further, secondary considerations also support a finding of non-obviousness. In view of the above, JP 2001-323066, JP 2001-323062, JP 2001-323065, JP 2001-323064, and JP 2001-323063, whether considered separately or in combination, fail to show or suggest the present invention as recited in independent claim 9. Thus, independent claim 10 is patentable over JP 2001-323066, JP 2001-323062, JP 2001-323065, JP 2001-323064, and JP 2001-323063. Dependent claims are allowable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

Conclusion

Applicant believes this reply is fully responsive to all outstanding issues and places this application in condition for allowance. If this belief is incorrect, or other issues arise, the Examiner is encouraged to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 17195/002001).

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Respectfully submitted,

By 

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Attachments